Amendments to the Claims

1. (Previously presented) A fuel processor based fuel cell system comprising:

a primary reactor adapted to generate a gaseous reformate from feed inputs comprising steam;

a high temperature proton exchange membrane fuel cell (HT-PEMFC) stack in fluid communication with the primary reactor, said HT-PEMFC stack is adapted to receive the gaseous reformate for generating electrical power and to generate the steam needed for the primary reactor;

a compressor adapted to provide compressed air to the HT-PEMFC stack;

an anode exhaust condenser and a cathode exhaust condenser adapted to receive heat energy from a respective exhaust from the HT-PEMFC and to heat air used by the compressor; and

a stack excess steam condenser, wherein the air is also used to condense a portion of the steam provided to the excess steam condenser before being fed to the compressor.

2. (Original) A fuel processor based fuel cell system according to claim 1 wherein the feed inputs further comprises air, a hydrogen-containing fuel, and combinations thereof.

3. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a water gas shift (WGS) reactor in fluid communication between the primary reactor and the HT-PEMFC stack, and a primary reactor heat exchanger in fluid communication between the primary reactor and the WGS reactor to heat at least the

steam before being used in the primary reactor with heat energy from the gaseous reformate.

4. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a catalytic combustor in fluid communication with a superheat heat exchanger to heat at least the steam before being used in the primary reactor with heat energy from the catalytic combustor.

5. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a WGS reactor heat exchanger provided in fluid communication between a WGS reactor and the HT-PEMFC stack, the WGS reactor heat exchanger is adapted to heat the steam before being used in the primary reactor with heat energy from the gaseous reformate.

6. (Original) A fuel processor based fuel cell system according to claim 1 wherein the primary reactor is selected from the group consisting of an auto-thermal reactor and a steam reformer.

7. (Currently amended) A fuel processor based fuel cell system according to claim 1 ~~further comprising a stack excess steam condenser, and~~ wherein a portion of about two-thirds to about one-half of vaporized water in the steam is recondensed in the stack excess steam condenser and recycled to the HT-PEMFC stack for cooling needs.

8. (Original) A fuel processor based fuel cell system according to claim 1 wherein a portion of about one-third to one-half of vaporized water in the steam is used in the primary reactor.

9. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a catalytic combustor, and wherein excess hydrogen unconsumed by the HT-PEMFC stack in a catalyst reaction using the gaseous reformate is fed into the catalytic combustor to maintain a temperature required for producing the gaseous reformate in the primary reactor.

10. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a catalytic combustor in fluid communication with a combustor air preheat heat exchanger which is adapted to receive heat energy from combustor exhaust and to preheat air used in the catalytic combustor.

11. (Original) A fuel processor based fuel cell system according to claim 1 further comprising anode and cathode exhaust liquid separators adapted to recover water from anode and cathode exhausts from the HT-PEMFC stack.

12. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a stack coolant liquid separator to separate liquid water from the steam exiting the HT-PEMFC stack.

13-14 (Canceled)

15. (Original) A fuel processor based fuel cell system according to claim 1 further comprising an anode exhaust preheat heat exchanger receiving anode exhaust from the HT-PEMFC stack and a bypass circuit used to divert the gaseous reformate into the anode exhaust preheat heat exchanger to provide greater heat input to the anode exhaust before sending the gaseous reformate to the HT-PEMFC stack.

16. (Previously presented) A fuel processor based fuel cell system according to claim 1 wherein the HT-PEMFC stack has an anode stoichiometry from about 1.0 to about 1.3.

17. (Original) A fuel processor based fuel cell system according to claim 1 wherein the primary reactor uses a ratio of steam to fuel carbon (S:C) from about 2 to about 5.

18. (Previously presented) A fuel processor based fuel cell system according to claim 1 wherein the primary reactor uses a ratio of atomic oxygen in air flow to carbon in fuel flow (O:C) from about 0.6 to about 1.5.

19. (Canceled)

20. (Original) A fuel processor based fuel cell system according to claim 1 further comprising a water/steam separator to remove excess water contained in the gaseous reformate before being fed to the HT-PEMFC stack.

21. (Previously presented) A fuel processor based fuel cell system comprising:

a reactant stream comprising steam;

a primary reactor adapted to generate a gaseous reformate using the reactant stream;

a primary reactor heat exchanger in fluid communication with the primary reactor to preheat the reactant stream;

a high temperature proton exchange membrane fuel cell (HT-PEMFC) stack adapted to receive the gaseous reformate for generating electrical power, the HT-PEMFC stack being cooled by water and the steam being provided via water vaporization of the water in the HT-PEMFC stack;

a catalytic combustor; and

a superheat heat exchanger adapted to receive heat energy from the catalytic combustor to superheat the reactant stream, the superheated reactant stream is then combined with compressed air before being used in the primary reactor.

22. (Original) A fuel processor based fuel cell system according to claim 21 wherein the reactant stream further comprises a hydrogen-containing fuel, air, and combinations thereof.

23. (Canceled)

24. (Previously presented) A fuel processor based fuel cell system according to claim 21 wherein the superheated reactant stream combined with compressed air is further combined with a hydrogen-containing fuel before being used in the primary reactor.

25. (Original) A fuel processor based fuel cell system according to claim 21 further comprising a water gas shift (WGS) reactor provided in fluid communication with the primary reactor, a WGS heat exchanger in fluid communication with the WGS reactor, and an optional final CO-polishing stage provided in fluid communication between the WGS heat exchanger and the HT-PEMFC stack.

26. (Original) A fuel processor based fuel cell system according to claim 21 wherein anode exhaust from the HT-PEMFC stack before entering into the combustor to be consumed is preheated by an anode exhaust preheat heat exchanger which is adapted to receive heat energy from combustor exhaust.

27. (Original) A fuel processor based fuel cell system according to claim 21 further comprising a water injector used to put water into the reactant stream prior to entering into the superheat heat exchanger in order to provide the required steam for the primary reactor at startup.

28. (Previously presented) A fuel processor based fuel cell system comprising:

a reactant stream comprising steam;

a primary reactor adapted to generate a gaseous reformate using the feed inputs;

a high temperature proton exchange membrane fuel cell (HT-PEMFC) stack adapted to receive the gaseous reformate for generating electrical power, the HT-PEMFC stack being cooled by water and the steam being provided via water vaporization of the water in the HT-PEMFC stack;

a water gas shift (WGS) reactor in fluid communication between the primary reactor and the HT-PEMFC stack;

a primary reactor heat exchanger situated between the primary reactor and the WGS reactor to preheat the reactant stream;

a catalytic combustor; and

a superheat heat exchanger adapted to receive heat energy from the catalytic combustor to superheat the reactant stream, the superheated reactant stream is then combined with compressed air before being used in the primary reactor.

29. (Previously presented) A fuel processor based fuel cell system according to claim 16 wherein the HT-PEMFC stack has an anode stoichiometry in a preferred range of about 1.1 to about 1.2.

30. (Previously presented) A fuel processor based fuel cell system according to claim 18 wherein the primary reactor uses a ratio of atomic oxygen in air flow to carbon in fuel flow (O:C) in a preferred range of about 0.75 to about 0.8.